

**WHAT IS CLAIMED:**

1           1. A method of reducing damage resulting from  
2 environmental electromagnetic effects on a non-metallic  
3 surface, said method comprising:

4           disposing a polymeric sheet material over the  
5 non-metallic surface; and

6           disposing a metal layer between the non-  
7 metallic surface and the polymeric sheet material.

1           2. A method according to claim 1, wherein the  
2 non-metallic surface is the surface of an ungrounded  
3 object.

1           3. A method according to claim 1, wherein the  
2 object is an aircraft or a marine vessel.

1           4. A method according to claim 1, wherein the  
2 polymeric sheet material comprises a polymer selected  
3 from the group consisting of polyolefins, polyimides,  
4 polyesters, polyacrylates, halopolymers, and combinations  
5 thereof.

1           5. A method according to claim 1, wherein the  
2 polymeric sheet material is a polymeric fabric.

1           6. A method according to claim 1, wherein the  
2 polymeric sheet material is a halopolymer fabric.

1                   7. A method according to claim 1, wherein the  
2 polymeric sheet material is a fluoropolymer fabric.

1                   8. A method according to claim 1, wherein  
2 said disposing comprises:

3                   adhering the polymeric sheet material directly  
4 to the non-metallic surface.

1                   9. A method according to claim 1, wherein the  
2 metal layer is a metal mesh or an expanded metal foil.

1                   10. A method according to claim 1, wherein the  
2 metal layer is bonded to the polymeric sheet material and  
3 wherein said disposing a polymeric sheet material and  
4 said disposing a metal layer are carried out in a single  
5 step.

1                   11. A method according to claim 10, wherein  
2 the polymeric sheet material is a halopolymer sheet  
3 material and wherein the metal layer is bonded to the  
4 polymeric sheet material by a method comprising:

5                   substituting at least a portion of halogen  
6 atoms on the outermost surface of the halopolymer sheet  
7 material with hydrogen and oxygen or oxygen-containing  
8 groups to thus provide an oxyhalopolymer sheet material;  
9 and

10                  contacting the oxyhalopolymer sheet material  
11 with a solution or gas comprising a metal for a period of  
12 time sufficient to facilitate bonding of the metal to the  
13 oxyhalopolymer sheet material.

1           12. A method according to claim 10, wherein  
2 the polymeric sheet material's surface comprises  
3 functional groups which will bind an electroless  
4 metallization catalyst and wherein the metal layer is  
5 bonded to the polymeric sheet material by a method  
6 comprising:

7           contacting the polymeric sheet material's  
8 surface's functional groups with an electroless  
9 metallization catalyst to obtain a catalytic surface; and

10           contacting the catalytic surface with an  
11 electroless metallization solution under conditions  
12 effective to metallize the polymeric sheet material's  
13 surface.

1           13. A method according to claim 10, wherein  
2 the metal layer is adhered directly to the non-metallic  
3 surface with an adhesive.

1           14. A method according to claim 1, wherein the  
2 polymeric sheet material is a first polymeric sheet  
3 material and wherein said method further comprises:

4           disposing a second polymeric sheet material  
5 over the first polymeric sheet material.

1           15. A method according to claim 14, wherein  
2 said method further comprises:

3           disposing a second metal layer between the  
4 first polymeric sheet material and the second polymeric  
5 sheet material.

1               16. A method according to claim 15, wherein  
2 said method further comprises:

3               disposing a third polymeric sheet material over  
4 the second polymeric sheet material; and

5               disposing a third metal layer between the  
6 second polymeric sheet material and the third polymeric  
7 sheet material.

1               17. A method according to claim 1, wherein the  
2 environmental electromagnetic effect is a lightning  
3 strike.

1               18. An object comprising:

2               a substrate having a non-metallic surface;

3               a halopolymer sheet material disposed over said  
4 substrate's non-metallic surface; and

5               a metal layer disposed between said halopolymer  
6 sheet material and said substrate's non-metallic surface.

1               19. An object according to claim 18, wherein  
2 said substrate is ungrounded.

1               20. An object according to claim 18, wherein  
2 said substrate is an aircraft or a marine vessel.

1               21. An object according to claim 18, wherein  
2 said halopolymer sheet material is a halopolymer fabric.

1                   22. An object according to claim 18, wherein  
2 said halopolymer sheet material is a fluoropolymer  
3 fabric.

1                   23. An object according to claim 18, wherein  
2 said metal layer is adhered directly to said substrate's  
3 non-metallic surface with an adhesive.

1                   24. An object according to claim 18, wherein  
2 said metal layer is a metal mesh or an expanded metal  
3 foil.

1                   25. An object according to claim 18, wherein  
2 said metal layer is adhered to said halopolymer sheet  
3 material.

1                   26. An object according to claim 18, wherein  
2 said metal layer is bonded to said halopolymer sheet  
3 material.

1                   27. An object according to claim 26, wherein  
2 said metal layer is bonded to said halopolymer sheet  
3 material by a method comprising:

4                   substituting at least a portion of halogen  
5 atoms on said halopolymer sheet material's outermost  
6 surface with hydrogen and oxygen or oxygen-containing  
7 groups to thus provide an oxyhalopolymer sheet material;  
8 and

9                   contacting the oxyhalopolymer sheet material  
10 with a solution or gas comprising a metal for a period of

11 time sufficient to facilitate bonding of the metal to the  
12 oxyhalopolymer sheet material.

1                   28. An object according to claim 26, wherein  
2 said halopolymer sheet material's surface comprises  
3 functional groups which will bind an electroless  
4 metallization catalyst and wherein said metal layer is  
5 bonded to said halopolymer sheet material by a method  
6 comprising:

7                   contacting said halopolymer sheet material's  
8 surface's functional groups with an electroless  
9 metallization catalyst to obtain a catalytic surface; and

10                  contacting the catalytic surface with an  
11 electroless metallization solution under conditions  
12 effective to metallize said halopolymer sheet material's  
13 surface.

1                   29. An object according to claim 26, wherein  
2 said metal layer is adhered directly to said substrate's  
3 non-metallic surface with an adhesive.

1                   30. An object according to claim 26, wherein  
2 said halopolymer sheet material is a halopolymer fabric.

1                   31. An object according to claim 26, wherein  
2 said halopolymer sheet material is a fluoropolymer  
3 fabric.

1                   32. An object according to claim 18 further  
2 comprising:

3                   a polymeric sheet material disposed over said  
4    halopolymer sheet material.

1                   33. An object according to claim 32 further  
2    comprising:

3                   a second metal layer disposed between said  
4    halopolymer sheet material and said polymeric sheet  
5    material.

1                   34. An object according to claim 33, wherein  
2    said polymeric sheet material is a first polymeric sheet  
3    material and wherein said object further comprises:

4                   a second polymeric sheet material disposed over  
5    said first polymeric sheet material; and

6                   a third metal layer disposed between said first  
7    polymeric sheet material and said second polymeric sheet  
8    material.

1                   35. A laminate comprising:

2                   a metal layer having a first surface and a  
3    second surface;

4                   a halopolymer sheet material bonded or adhered  
5    to the first surface of said metal layer; and

6                   an adhesive disposed on the second surface of  
7    said metal layer.

1                   36. A laminate according to claim 35, wherein  
2    said halopolymer sheet material is a fluoropolymer sheet  
3    material.

1                   37. A laminate according to claim 35, wherein  
2 said halopolymer sheet material is a halopolymer fabric.

1                   38. A laminate according to claim 35, wherein  
2 said halopolymer sheet material is a fluoropolymer  
3 fabric.

1                   39. A laminate according to claim 35, wherein  
2 said metal layer's first surface is bonded to said  
3 halopolymer sheet material.

1                   40. A laminate according to claim 39, wherein  
2 said metal layer's first surface is bonded to said  
3 halopolymer sheet material by a method comprising:

4                   substituting at least a portion of halogen  
5 atoms on said halopolymer sheet material's outermost  
6 surface with hydrogen and oxygen or oxygen-containing  
7 groups to thus provide an oxyhalopolymer sheet material;  
8 and

9                   contacting the oxyhalopolymer sheet material  
10 with a solution or gas comprising a metal for a period of  
11 time sufficient to facilitate bonding of the metal to the  
12 oxyhalopolymer sheet material.

1                   41. A laminate according to claim 39, wherein  
2 said halopolymer sheet material's surface comprises  
3 functional groups which will bind an electroless  
4 metallization catalyst and wherein said metal layer's  
5 first surface is bonded to said halopolymer sheet  
6 material by a method comprising:

7                   contacting said halopolymer sheet material's  
8 surface's functional groups with an electroless  
9 metallization catalyst to obtain a catalytic surface; and

10                  contacting the catalytic surface with an  
11 electroless metallization solution under conditions  
12 effective to metallize said halopolymer sheet material's  
13 surface.

14                  42. A laminate comprising:

15                  a halopolymer fabric having a first surface and  
16 a second surface;

17                  a metal layer bonded or adhered to the first  
18 surface of said halopolymer fabric; and

19                  an adhesive disposed on the second surface of  
20 said halopolymer fabric.

1                  43. A laminate according to claim 42, wherein  
2 said halopolymer fabric is a fluoropolymer fabric.

1                  44. A laminate according to claim 42, wherein  
2 said metal layer bonded to the first surface of said  
3 halopolymer fabric.